VACUUM CLEANER PROVIDED WITH AN AUXILIARY PULL-OUT DEVICE FOR AN ELECTRICAL CABLE

The invention relates to a vacuum cleaner according to the precharacterising part of claim 1.

From US 3,999,640 a cable winding device, in particular for vacuum cleaners and other household appliances, is known. The vacuum cleaner disclosed in this state of the art comprises an opening which can be closed by means of a door, through which opening a power supply cable and an electric plug can be retracted into the body of the vacuum cleaner when said vacuum cleaner is not in use. In this non-used state of the vacuum cleaner, the power supply cable and the electric plug are fully accommodated behind the door in the body of the vacuum cleaner. The door can be opened by activating a foot-operated key. At the same time the electric plug is pulled out by a catch connected to the door. In this way, the electric plug hidden in the body of the vacuum cleaner becomes easily accessible when the vacuum cleaner is to be operated. This arrangement is however associated with a disadvantage that a separate foot-operated key is required to operate the door and the catch. This makes it awkward to use the vacuum cleaner.

It is the object of the invention to improve a generic vacuum cleaner with an auxiliary device for moving the electric plug such that the auxiliary device is easy to operate. In particular, a vacuum cleaner is to be created which can be used in an ergonomic and simple manner by a user.

According to the invention this object is met in that the vacuum cleaner is provided with a mobile handle connected to the auxiliary device, wherein the auxiliary device is

activated by moving the handle. This solution is associated with an advantage in that there is no need to provide a separate activation element for the auxiliary device. Activation of the auxiliary device by means of the mobile handle provides a further advantage in that it becomes possible to take the power supply cable or the electric plug directly by hand for unwinding the cable when the user has activated the vacuum cleaner handle.

Coupling not only relates to an effective mechanical or electrical connection between the handle and the auxiliary device, but to any known type of an effective connection which as a result of a causal movement of the handle triggers a desired effective reaction at the auxiliary device. The auxiliary device not only comprises a control element, which can for example be a mechanical pick-up element that moves the electric plug, but in particular it can comprise any type of sensor, for example a release mechanism or an electric switch, which detects movement of the handle and on the basis of detection of the handle movement causes a control element to become functional.

Most of the time, vacuum cleaners are removed from the immediate surroundings of the user when they are not operative. To this effect, the vacuum cleaner preferably comprises a handle by which the user can transport the vacuum cleaner from the place of storage to the place where cleaning is to take place and back again. It can thus be expected that prior to the vacuum cleaner being operated, the handle is held at least once by the user. The invention provides for this action of holding the handle at least once, before any renewed use of the vacuum cleaner, to be used to activate the auxiliary device. The user thus need not engage in an additional action in order to activate the auxiliary device.

In a preferred embodiment of the invention, the auxiliary device comprises a pick-up element, which when the handle is moved out of its home position moves the electric plug into the second position. Preferably, the pick-up element holds the electric plug on that side of the electric plug that faces the power supply cable so that the electric plug from a first position in which the power supply cable is wound to the shortest length thereof, can be pulled to a second position where said cable or plug can be taken by hand for unwinding the cable. The pick-up element is designed such that the electric plug is reliably held by the pick-up element, even if the cable winding device exerts considerable tensile forces on the power supply cable. The pick-up element is preferably designed such that when the electric plug is taken and when the power supply cable is unwound by hand, the power supply cable can be pulled out along the pick-up element without any hindrance. The pick-up element according to the invention creates a simple and cost-effective mechanical device to move the electric plug from its first position, in which the power supply cable is wound to the shortest length thereof, to a second position where said cable or plug can be taken by hand for unwinding the cable.

In a simple variant of the invention, the pick-up element is attached directly to the handle. Direct attachment of the pick-up element to the handle makes particularly good sense if the handle is bow-shaped, and the two limb-shaped ends of the handle are of adequate length so that the pick-up element pulls the electric plug sufficiently far out of the body of the vacuum cleaner when the handle is swivelled. This variant is not only particularly economical to implement, but its function is made clear to a user in a particularly visible way.

If the pick-up element is held on the vacuum cleaner so as to be electrically activatable, it can be activatable by an electric switch that can be switched by the handle. For example, the pick-up element can be activated by means of an electric motor if the electric switch is closed and the electric motor is supplied with power. The electric switch can be provided so as to be in various different positions in relation to the handle. In this arrangement, depending on the position of the electric switch in relation to the handle, the pick-up element is activated in a particular position of the handle. The position of the handle in which position the vacuum cleaner is carried, or the position of the handle in which position the handle moves from its inoperative position in the direction of the body of the vacuum cleaner can be preferred positions of the handle, in which positions the electric switch activates the pick-up element. Despite the lack of power supplied by way of the power supply cable of the vacuum cleaner, the electrical energy for activating the electrically activatable pick-up element can be supplied by an electrical energy storage device, such as a battery or a rechargeable battery. An electrically activatable pick-up element provides an advantage in that the user need not expend increased force for moving the handle. The energy for moving the pick-up element into the second position of the electric plug is taken from the energy store and need therefore not be provided by the user.

As an alternative, the pick-up element can be movably held on the vacuum cleaner and can be coupled to the handle by way of a mechanical component. In this arrangement the energy for moving the pick-up element is solely provided from the energy which is expended by the user for moving the handle. Mechanical coupling of the pick-up element to

the handle obviates the need for a separate power supply for activating the pick-up element. Thus, the pick-up element according to the invention is ready for operation if the vacuum cleaner is not connected to any energy supply. In particular, the use of mechanical components for coupling the pick-up element to the handle is generally more economical than an electric solution.

In one embodiment of the invention, the handle and the pick-up element are swivellably held on the vacuum cleaner. In this case the handle is for example coupled to the pick-up element by way of a lever, a toothed gearing arrangement or a belt drive. The pick-up element can hold the electric plug in its first position, in which the power supply cable is wound to the shortest length thereof, when the handle is in its inoperative position. As soon as the handle is swivelled from its inoperative position into its carrying position, the pick-up element swivels the electric plug from the first position to the second position, where said cable or plug can be taken by hand for unwinding the cable. It can also be provided for the pick-up element not to be swivelled when the handle is swivelled from its inoperative position to its carrying position, but for swivelling of the pick-up element to take place only when the handle is moved from its carrying position back to its inoperative position. As an alternative it can be provided for the pick-up element to be in the first position of the electric plug if the handle is in its inoperative position and the pick-up element swivels to the second position of the electric plug when the handle is swivelled from its inoperative position in the direction of the body of the vacuum cleaner. In the first alternative the electric plug is moved to the position where it can be taken by hand as soon as the vacuum cleaner is picked up for carrying. In the second alternative the electric plug is moved to the

position where it can be taken by hand as soon as the vacuum cleaner, after being carried, is put down and the handle is swivelled into its inoperative position. In the third alternative, the electric plug is moved into its position where it can be taken by hand when the vacuum cleaner after being carried is put down, the handle is swivelled into its inoperative position, and is moved towards the body of the vacuum cleaner by an additional push on the handle. Each of these alternatives can make it possible to operate the vacuum cleaner in a simple manner. The mechanical components which couple the handle to the pick-up element can be designed such that all described alternatives are selectable within a vacuum cleaner. To this effect, an actuator which can be operated by the user can be provided, which actuator sets the mechanical gearing components according to the alternative desired by the user.

If the handle is swivellable and the pick-up element is slidably held on the vacuum cleaner, the handle can comprise a lever or a cam which operates a slide or a telescopic arm connected to the pick-up element. The use of a pick-up element that is slidably held on the vacuum cleaner has an advantage in that the electric plug together with the power supply cable can be pulled out further from the cable winding device than would be possible in the case of a pick-up element that is swivellably held to the housing. Depending on the position of the lever or cam on the handle, the slidable pick-up element in a particular position of the swivellable handle is moved to the second position of the power supply cable. In one embodiment of the invention, the pick-up element is preferably moved into the second position of the electric plug when the swivellable handle is in the carrying position. The slidable pick-up element can be pre-tensioned to the first

position of the electric plug by means of spring-elastic pre-tensioning or by means of a forced guide. Such pre-tensioning of the slidable pick-up element ensures that said pick-up element returns to the first position of the electric plug when the swivellable handle is swivelled into its inoperative position. This is associated with an advantage in that, when the handle is in its inoperative position and the vacuum cleaner is ready for operation, the pick-up element does not protrude beyond the external contour of the vacuum cleaner.

As an alternative, the handle can be slidable and the pick-up element can be swivellably held on the vacuum cleaner. To this effect the pick-up element preferably comprises a lever or a cam which activates a slider which is connected to the handle. The pick-up element is preferably coupled to a toothed gearing arrangement which meshes a toothed rack on the handle. If the pick-up element, which carries a toothed wheel, is coupled to the toothed rack on the handle by means of an intermediate toothed wheel, then the pick-up element is swivelled from the first position of the electric plug into the second position of the electric plug when the handle is pulled from its inoperative position into its carrying position. When the handle is pushed back into its inoperative position again, the pick-up element swivels back into the first position of the plug. In the pushed-in position of the handle, the pick-up element is swivelled back behind the contour of the vacuum cleaner, and the vacuum cleaner is ready for operation without the pick-up element of the vacuum cleaner protruding in an interfering way.

In a further alternative both the handle and the pick-up element can be slidably held on the vacuum cleaner. To operate the slidable pick-up element by means of the

slidable handle, a catch can be provided which couples the handle to the pick-up element. This embodiment of the invention provides an advantage in that the pick-up element is slid from the first position of the electric plug into the second position exactly to the same extent as the handle is pulled out of the body of the vacuum cleaner. This provides an advantage in that the user can influence how far the electric plug protrudes by the extent to which said user pulls the handle out from the body of the vacuum cleaner.

In a further advantageous embodiment of the invention, by means of a locking element or a switching gate, the pick-up element is held so at to be pre-tensioned in the first position of the electric plug, and the locking element or the switching gate can be moved from its home position by moving the handle. Due to the pre-tensioning of the pick-up element, minimal movement of the handle suffices to trigger the locking element or the switching gate and to move the pick-up element fully from its first position into the second position of the electric plug. The locking element or switching gate is preferably designed such that briefly touching the handle from its inoperative position in the direction of the body of the vacuum cleaner suffices to move the pick-up element fully into the second position of the electric plug. This provides an advantage in that the user only needs to make a brief pulse-like movement to fully release the pick-up element.

In an advantageous improvement of this variant, for winding the power supply cable, the pick-up element can be pre-tensioned in the first position of the electric plug by the energy stored in the cable winding device. This is associated with an advantage in that there is no need for the user to pre-tension the pick-up element separately into

the first position of the electric plug, but instead the cable winding device pre-tensions the pick-up element into the first position of the electric plug when the power supply cable of the cable winding device is shortened to its shortest length.

Below, the invention is explained in more detail with reference to various embodiments.

The following are diagrammatically shown:

Figure 1 a vacuum cleaner according to the invention, comprising a pick-up element attached to the handle;

Figure 2 a vacuum cleaner according to the invention, comprising a handle swivellably held on the vacuum cleaner and a pick-up element swivellably held on the vacuum cleaner;

Figure 3 a vacuum cleaner according to the invention, comprising a handle swivellably held on the vacuum cleaner and a pick-up element slidably held on the vacuum cleaner;

Figure 4 a vacuum cleaner according to the invention, comprising a handle slidably held on the vacuum cleaner and a pick-up element swivellably held on the vacuum cleaner;

Figure 5 a vacuum cleaner according to the invention, comprising a handle slidably held on the vacuum cleaner and a pick-up element slidably held on the vacuum cleaner;

Figure 6a an enlarged section of a vacuum cleaner according to the invention, comprising a locking element which holds the pick-up element under pre-tension;

Figure 6b an enlarged section of a vacuum cleaner according to the invention, comprising a switching gate which holds the pick-up element under pre-tension; and

Figure 7 a vacuum cleaner according to the invention with a pick-up element which is electrically activatable by means of a switch.

Figure 1 diagrammatically shows a vacuum cleaner 1. The vacuum cleaner 1 comprises a body 2 on which a handle 3 is swivellably held. The handle 3 is swivellable on its swivelling axis 4 from an inoperative position A into a carrying position B. A cable winding device 5 is arranged within the body 2. The cable winding device 5 comprises a cable housing 6 in which a cable drum 7 is held so as to be rotatable on an axis 8. A first end of a power supply cable 9 is attached to the cable drum 7. A second end of the power supply cable 9 comprises an electric plug 10. Behind the external contour of the body 2, the electric plug 10 is held in a first position C in which the power supply cable 9 is wound to its shortest length on the cable drum 7. A pick-up element 11 is attached to the handle 3. The pick-up element 11 is used as an auxiliary device 12 to move the power supply cable 9 from the first position C to a second position D in which the power supply cable 9 or the electric plug 10 can be taken by hand for unwinding the power supply cable 9 from the cable drum 7. The pick-up element 11 is dish-shaped and comprises a slot that is sufficiently wide to let the power supply cable 9 through,

and sufficiently narrow to grip the electric plug 10. In order to grip the electric plug 10, the dish-shaped pick-up element 11 holds the electric plug 10 from behind. In the carrying position B of the handle 3, the electric plug 10 is in the second position D. From the second position D of the electric plug 10, said electric plug 10 can be pulled by hand upwards and out of the dish-shaped pick-up element 11. After the user has taken the electric plug 10 from the pick-up element 11, the handle 3 together with the pick-up element 11 attached to it can be swivelled back into the inoperative position A of the handle 3.

In a design variant according to Figure 2, the handle 3 is attached to the body 2 of the vacuum cleaner 1 so as to be swivellable on the swivelling axis 4. The pick-up element 11 is held on the body 2 of the vacuum cleaner 1 so as to be swivellable on a rotary axis 13 from the first position C to the second position D. The swivelling axis 4 of the handle 3 is connected to the rotary axis 13 of the pick-up element 11 by way of a mechanical drive 14. The mechanical drive 14 comprises a first pulley 15, which when the handle 3 is swivelled commences to rotate. A second pulley 16 is connected to the pick-up element 11 and together with the latter is rotatable on the rotary axis 13. The first pulley 15 is coupled to the second pulley 16 by way of a belt drive 17. When the handle 3 is swivelled from its inoperative position A to its carrying position B, the first pulley 15 is rotated anticlockwise, and the belt drive 17 moves. The belt drive 17 in turn rotates the second pulley 16 anticlockwise and swivels the pick-up element 11 from the first position C into the second position D. By relocating the belt drive 17 such that the two sides of the belt drive 17 cross, the coupling between the handle 3 and the pick-up element 11 can be changed. The pick-up element 11 is then swivelled into the second

position D when the handle 3 is swivelled into its inoperative position A.

In the design variant according to Figure 3, the handle 3 is held on the body 2 so as to be swivellable from the inoperative position A into the carrying position B. In a slide bearing 18, the pick-up element 11 is slidably held in the vacuum cleaner 1 so as to be movable from the first position C into the second position D. The handle 3, which is rotatable on the swivelling axis 4, is connected to a lever 19 which is designed in the manner of a cam 20. The cam 20 activates the pick-up element 11, which is slidably held in the vacuum cleaner 1, when the handle 3 is swivelled from its inoperative position A into its carrying position B. Instead of providing a cam 20 which pushes onto the end of the pick-up element 11, which end faces the cam 20, a lever can be provided, which by means of a swivelling joint (not shown) is directly coupled to the pick-up element 11. Directly coupling the handle 3 to the pick-up element 11 ensures that when the handle 3 is swivelled from the carrying position B to the inoperative position A, the pick-up element returns from the second position D to the first position C. If a cam 20 is used, as shown in Figure 3, a slide 21 is pre-tensioned to the first position C by means of a spring 22. In order to make it possible for the electric plug 10 to be moved out an adequate distance beyond the contour of the body 2 of the vacuum cleaner 1, the slide 21 can be a telescopic arm 23.

In the design variant according to Figure 4, the handle 3 is slidably held in the vacuum cleaner 1. The pick-up element 11 is swivellable from the first position C into the second position D on the rotary axis 13. The handle 3 comprises a toothed rack 24. A toothed gearing arrangement 25 meshes with the toothed rack 24, wherein said toothed

gearing arrangement 25 is coupled to the pick-up element 11 that is swivellable on the rotary axis 13. The toothed gearing arrangement 25 comprises a first toothed wheel 26 which is connected to the pick-up element 11, and comprises a second toothed wheel 27 which translates the sliding movement of the toothed rack 24 as a rotary movement to the first toothed wheel 26. In this way, when the handle 3 is pulled from its inoperative position A into its carrying position B, the pick-up element 11 is swivelled from the first position C into the second position D.

In the design variant according to Figure 5 both the handle 3 and the pick-up element 11 are slidably held in the vacuum cleaner 1. A catch 28 is attached to the handle 3, which is slidably held in the vacuum cleaner 1. The catch 28 engages a recess 29 on the slide 21. When the handle 3 is pulled from its inoperative position A into its carrying position B, the slide 21 together with the pick-up element 11 is pushed from the first position C to the second position D. When the handle 3 is withdrawn from the carrying position B to the inoperative position A, by means of the catch 28 which engages the recess 29 on the slide 21, the pick-up element 11 is returned from its second position D to its first position C. As an alternative to this, instead of the catch 28 engaging the recess 29 on the slide 21, a catch 28 can be provided which engages the end of the slide 21. In this case the slide 21 is pre-tensioned in the first position C of the pick-up element 11 by means of a spring. The slide 21 is then not returned to the first position C by means of the handle 3, but only by spring force.

Figures 6a and 6b show an enlarged section of a vacuum cleaner according to the invention. In particular, examples of locking devices are shown which hold the pick-up element

11 under pre-tension in the first position C. The pick-up element 11, which is swivellable on the rotary axis 13, is pre-tensionable to the first position C against the force of a compression spring 30. To block the pick-up element 11 in the pre-tensioned first position C, the pick-up element 11 comprises a locking bar 31 opposite the rotary axis 13. A locking element 32 is swivellably held on the vacuum cleaner 1 by means of a pivot bearing 33. The locking element comprises a detent 34 and a push button 35. The detent 34 holds the locking bar 31 from behind such that the pick-up element is held in a pre-tensioned first position C against the compression spring 30. The push button 35 is arranged opposite the pivot bearing 33 of the locking element 32. By pushing the handle 3 in the direction of the body 2 of the vacuum cleaner 1, the push button 35 of the locking element 32 is activated, and the locking element 32 swivels clockwise on the pivot bearing 33. As a result of the swivelling movement, the detent 34 releases the locking bar 31, and the pre-tensioned compression spring 30 swivels the pick-up element 11 on the rotary axis 13 from the first position C into the second position D. In this way, by simply touching the handle 3 from above, the locking device can be triggered and the pick-up element 11 immediately swivels from its first position C into its second position D.

As an alternative to the locking element 32 the locking device can also be a switching gate 36, as shown in Figure 6b. The switching gate 36 is formed by a slot-shaped elongated hole 37, which is formed on the pick-up element 11 that is swivellable on the rotary axis 13. A bolt 38 penetrates the elongated hole 37 and at its two ends is guided in a V-shaped groove 39. The V-shaped grooves 39 are formed opposite each other on the body 2 of the vacuum cleaner 1 and guide the bolt 38 along a V-shaped movement

track. In the position shown, according to the first position C the bolt 38 is at the end of the short side of the V-shaped groove. If the pick-up element 11 is swivelled from the first position C into the second position D, then the bolt 38 slides along the V-shaped groove in the direction of the end of the long side of the V-shaped groove 39. In this second position D, the pick-up element 11 is swivelled on the rotary axis 13 such that the slot-shaped elongated hole 37 on the pick-up element 11 can be swivelled from the horizontal position to the vertical position. By pushing the handle 3 in the direction of the body 2 of the vacuum cleaner 1, the handle 3 comes to rest against the upper edge of the end of the pick-up element 11 that comprises the elongated hole 37 and pushes the pick-up element on the rotary axis 13 clockwise into the first position C. The pick-up element 11 swivels back anticlockwise by a small angle until the bolt 38 rests against the end of the short side of the V-shaped groove 39. In this position, the pick-up element 11 is held against the pre-tension of the compression spring 30 in a first position C.

Figure 7 diagrammatically shows an electric variant of a vacuum cleaner according to the invention. The pick-up element 11 is swivellably held to the vacuum cleaner 1 on the rotary axis 13. The pick-up element 11 is swivellable, by means of an electric motor drive 40, between the first position C and the second position D. The electric motor drive 40 is activated by way of an electric switch 41. The switch 41 is attached to the vacuum cleaner 1 such that said switch can be activated by swivelling the handle 3. In the embodiment shown the electric switch 41 is activated and the current circuit to the electric motor drive is closed when the handle 3 is swivelled towards the body 2 of the vacuum cleaner 1. As an alternative, the switch 21 can

be designed or arranged such that the electric motor drive 40 is activated when the handle 3 is swivelled into the carrying position B.

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